

What is claimed is:

1. A substrate processing apparatus, comprising:

a substrate transfer section;

a plurality of modules, each of said plurality of modules
5 being detachably attached to said substrate transfer section; and

first substrate transfer means provided in said substrate
transfer section and capable of transferring a substrate or
substrates to said plurality of modules,

wherein said plurality of modules are piled up, separately
10 from one another, in a substantially vertical direction,

wherein each of said plurality of modules comprises:

a substrate processing chamber, having a hermetic
structure, for processing said substrate or said substrates;

an intermediate chamber having a hermetic structure and
15 being provided between said substrate processing chamber and said
substrate transfer section;

a first valve provided between said substrate processing
chamber and said intermediate chamber, said first valve being
capable of establishing hermetic isolation between said substrate
20 processing chamber and said intermediate chamber when said first
valve is closed and being capable of allowing said substrate or
said substrates to pass through said first valve when said first
valve is opened; and

a second valve provided between said intermediate chamber
25 and said substrate transfer section, said second valve being
capable of establishing hermetic isolation between said

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intermediate chamber and said substrate transfer section when
said second valve is closed and being capable of allowing said
substrate or said substrates to pass through said second valve
when said second valve is opened, and

5 wherein said intermediate chamber is provided with second
substrate transfer means capable of transferring said substrate
or said substrates to said substrate processing chamber.

2. A substrate processing apparatus as recited in claim 1,
wherein each of said plurality of modules comprises:

10 said substrate processing chamber, having a hermetic
structure of vacuum level, for processing said substrate or said
substrates;

15 said intermediate chamber having a hermetic structure of
vacuum level and being provided between said substrate processing
chamber and said substrate transfer section;

20 said first valve provided between said substrate
processing chamber and said intermediate chamber, said first
valve being capable of establishing hermetic isolation of vacuum
level between said substrate processing chamber and said
intermediate chamber when said first valve is closed and being
capable of allowing said substrate or said substrates to pass
through said first valve when said first valve is opened; and

25 said second valve provided between said intermediate
chamber and said substrate transfer section, said second valve
being capable of establishing hermetic isolation of vacuum level
between said intermediate chamber and said substrate transfer

section when said second valve is closed and being capable of allowing said substrate or said substrates to pass through said second valve when said second valve is opened.

3. A substrate processing apparatus as recited in claim 2, wherein said substrate processing chamber and said intermediate chamber can be independently reduced in pressure.

4. A substrate processing apparatus as recited in claim 1, wherein said intermediate chamber of each of said plurality of modules is further provided with substrate holding means capable of holding said substrate or said substrates, said substrate holding means being positioned closer to said substrate transfer section than said second substrate transfer means.

5. A substrate processing apparatus as recited in claim 1, wherein said substrate transfer section transfers said substrate or said substrates under atmospheric pressure.

6. A substrate processing apparatus as recited in claim 5, wherein said substrate processing chamber is a substrate processing chamber wherein said substrate is or said substrates are processed under a reduced pressure.

7. A substrate processing apparatus as recited in claim 1, wherein said substrate transfer section is further provided with a cassette holding means for holding a cassette capable of

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H3/ accommodating a plurality of said substrates, said first substrate transfer means being capable of transferring said substrate or said substrates between said cassette held by said cassette holding means and said plurality of modules.

5 8. A substrate processing apparatus as recited in claim 7, wherein said first substrate transfer ~~means~~^{device} is provided with a structure capable of transferring said cassette.

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10 9. A substrate processing apparatus as recited in claim 1, wherein said substrate transfer section is further provided with an elevator capable of vertically moving said first substrate transfer ~~means~~^{device}.

15 10. A substrate processing apparatus as recited in claim 9, wherein said substrate transfer section is further provided with a cassette introducing section for transferring said cassette into said substrate transfer section and carrying out said cassette from said substrate transfer section, said cassette introducing section being disposed at a predetermined height which is different from the height of said cassette holding ~~means~~^{device}.

20 11. A substrate processing apparatus as recited in claim 1, wherein said substrate processing apparatus is capable of processing a plurality of said substrates simultaneously, and said second substrate transfer ~~means~~^{device} is capable of transferring

simultaneously the same number of substrates as said plurality of substrates to be simultaneously processed by said substrate processing apparatus.

5 12. A substrate processing apparatus as recited in claim 11, wherein said substrate processing apparatus is a plasma enhanced processing apparatus for processing said substrates utilizing plasma, said substrate processing apparatus includes second
10 substrate holding means capable of holding said plurality of substrates with the substrates being laterally arranged side by side, and said substrate transfer means is capable of transferring simultaneously said plurality of substrates with the substrates being laterally arranged side by side.

15 13. A substrate processing apparatus as recited in claim 1, wherein said substrate processing apparatus is capable of processing a plurality of said substrates simultaneously, and said second substrate transfer means is capable of transferring said plurality of substrates one by one to respective their processing positions where said plurality of substrates are to be simultaneously processed.

20 14. A substrate processing apparatus, comprising:
a substrate transfer section;
a plurality of modules, each of said plurality of modules
being detachably mounted to said substrate transfer section; and
first substrate transfer means provided in said substrate

transfer section and capable of transferring a substrate or substrates to said plurality of modules,

wherein said plurality of modules are piled up, separately from one another, in a substantially vertical direction,

5 wherein each of said plurality of modules comprises:

a substrate processing chamber, having a hermetic structure, for processing said substrate or said substrates;

10 first and second intermediate chambers provided between said substrate processing chamber and said substrate transfer section, each of said first and second intermediate chambers having a hermetic structure, said first intermediate chamber being located closer to said substrate processing chamber than said second intermediate chamber, and said second intermediate chamber being located closer to said substrate transfer section than said first intermediate chamber;

15 a first valve provided between said substrate processing chamber and said first intermediate chamber, said first valve being capable of establishing hermetic isolation between said substrate processing chamber and said first intermediate chamber when said first valve is closed and being capable of allowing said substrate or said substrates to pass through said first valve when said first valve is opened;

20 a second valve provided between said first intermediate chamber and said second intermediate chamber, said second valve being capable of establishing hermetic isolation between said first intermediate chamber and said second intermediate chamber

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when said second valve is closed and being capable of allowing said substrate or said substrates to pass through said second valve when said second valve is opened; and

5 a third valve provided between said second intermediate chamber and said substrate transfer section, said third valve being capable of establishing hermetic isolation between said second intermediate chamber and said substrate transfer section when said third valve is closed and being capable of allowing said substrate or said substrates to pass through said third valve when said third valve is opened,

10 wherein said second intermediate chamber is provided with substrate holding means capable of holding said substrate or said substrates, and

15 wherein said first intermediate chamber is provided with second substrate transfer means capable of transferring said substrate or said substrates between said substrate holding means and said substrate processing chamber.

15. A substrate processing apparatus as recited in claim 14, wherein each of said plurality of modules comprises:

20 said substrate processing chamber, having a hermetic structure of vacuum level, for processing said substrate or said substrates;

25 said first and second intermediate chambers provided between said substrate processing chamber and said substrate transfer section, each of said first and second intermediate chambers having a hermetic structure of vacuum level, said first

intermediate chamber being located closer to said substrate processing chamber than said second intermediate chamber, and said second intermediate chamber being located closer to said substrate transfer section than said first intermediate chamber;

5 said first valve provided between said substrate processing chamber and said first intermediate chamber, said first valve being capable of establishing hermetic isolation of vacuum level between said substrate processing chamber and said first intermediate chamber when said first valve is closed and
10 being capable of allowing said substrate or said substrates to pass through said first valve when said first valve is opened;

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 said second valve provided between said first intermediate chamber and said second intermediate chamber, said second valve being capable of establishing hermetic isolation of
15 vacuum level between said first intermediate chamber and said second intermediate chamber when said second valve is closed and being capable of allowing said substrate or said substrates to pass through said second valve when said second valve is opened;
 and

20 said third valve provided between said second intermediate chamber and said substrate transfer section, said third valve being capable of establishing hermetic isolation of vacuum level between said second intermediate chamber and said substrate transfer section when said third valve is closed and
25 being capable of allowing said substrate or said substrates to pass through said third valve when said third valve is opened.

16. A substrate processing apparatus as recited in claim 15, wherein said substrate processing chamber, said first intermediate chamber and said second intermediate chamber can be independently reduced in pressure.

5 17. A substrate processing apparatus as recited in claim 14, wherein said substrate transfer section transfers said ~~substrate~~ ~~or said~~ substrates under atmospheric pressure.

10 18. A substrate processing apparatus as recited in claim 17, wherein said substrate processing chamber is a substrate processing chamber wherein said substrate is or said substrates are processed under a reduced pressure.

19. A substrate processing apparatus as recited in claim 14, wherein said substrate holding ^{device} ~~means~~ is a heat-resistant ~~substrate holding~~ ^{device} ~~means~~.

15 20. A substrate processing apparatus as recited in claim 14, wherein said substrate transfer section is further provided with ~~a cassette holding~~ ^{device} ~~means~~ for holding a cassette capable of accommodating a plurality of said substrates, said first ~~substrate transfer~~ ^{device} ~~means~~ being capable of transferring said
20 substrate or said substrates between said cassette held by said ~~a cassette holding~~ ^{device} ~~means~~ and said plurality of modules.

21. A substrate processing apparatus as recited in claim 20,
wherein said first substrate transfer ^{device}~~means~~ is provided with a
structure capable of transferring said cassette.

22. A substrate processing apparatus as recited in claim 14,
wherein said substrate transfer section is further provided with
an elevator capable of vertically moving said first substrate
transfer ^{device}~~means~~.

23. A substrate processing apparatus as recited in claim 22,
wherein said substrate transfer section is further provided with
a cassette introducing section for transferring said cassette
into said substrate transfer section and carrying out said
cassette from said substrate transfer section, said cassette
introducing section being disposed at a predetermined height
which is different from the height of said cassette holding
^{device}~~means~~.

24. A substrate processing apparatus as recited in claim 14,
wherein said substrate processing apparatus is capable of
processing a plurality of said substrates simultaneously, and
said second substrate transfer ^{device}~~means~~ is capable of transferring
simultaneously the same number of substrates as said plurality
of substrates to be simultaneously processed by said substrate
processing apparatus.

25. A substrate processing apparatus as recited in claim 24,

wherein said substrate processing apparatus is a plasma enhanced processing apparatus for processing said substrates utilizing plasma, said substrate processing apparatus includes second substrate holding means capable of holding said plurality of substrates with the substrates being laterally arranged side by side, and said substrate transfer means is capable of transferring simultaneously said plurality of substrates with the substrates being laterally arranged side by side.

26. A substrate processing apparatus as recited in claim 14, wherein said substrate processing apparatus is capable of processing a plurality of said substrates simultaneously, and said second substrate transfer ^{device} means is capable of transferring said plurality of substrates one by one to respective their processing positions where said plurality of substrates are to be simultaneously processed.